MODIS Team Meeting

February 20, 1996

	Anderson, Ken	x	Jarosz, Mark	x	Sabatino, Rick
x	Barnes, Bill		Johnson, Eric		Safren, Harvey
x	Bolton, John	x	Kiwak, Robert	x	Shears, Lisa
	Cicchelli, Sal	x	Knight, Ed	x	Silva, Bob
	Congedo, Cherry	x	Martineau, Bob	x	Thompson, Les
x	Daelemans, George	x	Maxwell, Marvin		Waluschka, Eugene
	Davis, Mitch	x	Mocarsky, Bill	x	Weber, Richard
	Florez, Jose		Montgomery, Harry		
x	Godden, Gerry	x	Park, Hongwoo		
	Graziani, Larissa		Philips, Helen		
x	Guenther, Bruce	x	Roberto, Mike		

Attendees preceded by an 'x'

MODIS Technical Weekly **February 23, 1996**
sent to MODIS.Review on 2/27/96 at

Ken Anderson reported that SBRS has completed an extensive reevaluation of optical component bonding procedures and materials. Based on this review, several material and process changes are being made. All PFM optics will be rebonded. The NIR will be completely rebuilt with new lenses; the remaining objectives will be refurbished (although the VIS may be rebuilt). Penalty thermal and vibration tests will then be performed at the objective level. The schedule impact is approximately five weeks, but this is considered necessary in light of the repeated bond failures.

Ken has also emailed Ed Knight and Claire Wilda a note regarding the possibility of preparing for a splinter session on S/C level testing at the March QMR at SBRS. Ken believes this would be a good time to close out some of the open issues from the 11/1 meeting at Valley Forge.

Dan Powers has recently written two thermal analysis memos on the radiative cooler:
1) In a memo dated February 5, Dan wrote about the MODIS radiative cooler cold focal plane assembly (CFPA) detector temperature predictions during a lunar calibration maneuver. Results showed that the detectors do not violate the 85.0 +/- 0.1 K temperature requirement while the calibration is being performed. However, this requirement is violated shortly after the calibration is performed with the temperature rising to about 85.8 K; and it takes about one orbit for the detectors to return to 85.0 K. This analysis was performed for the LWIR CFPA (the S/MWIR would perform a little better than the LWIR). Details of the maneuver are included in the memo.
2) Dan updated the MODIS radiative cooler flight temperature predictions in a memo dated February 8. The updated flight predictions for lowest temperature achievable (LTA), cold, and hot cases are 66.8, 75.8, and 78.5 K respectively for the CFPAs. The thermal mathematical model (TMM) used to make these predictions was updated based on thermal vacuum test data acquired during unit level testing of the cooler with attached aft optics assembly in October.

Bill Barnes, Hongwoo Park, Stu Biggar, and Jim Young have status and technical comments concerning the solar-radiation based calibration for MODIS at SBRS:
1) SBRC - Bill Barnes
a) The heliostat has been ordered.
b) Bill and Hongwoo have discussed how to do his reflectance experiment. The solar beam from the heliostat is aimed at the diffuser/SDSM opening(s) and then redirected to a halon diffuser mounted above the Earth-view port. This eliminates the need for a second mirror and the problem of elevating the heliostat between measurements.
c) The people at Labsphere can supply a 24" X 24" halon diffuser (may be made of more than one piece) for 3 $K, in 3 weeks ARO. The order will probably be placed when Hongwoo returns from CA.
2. Comments on Stuart's mail dated 2/1/96 and the mirror flatness - Bill Barnes

a) Bill has ordered a spare mirror for the heliostat
b) Gene Waluschka has found a device to measure the spectral reflectance of the heliostat mirror (editor's note: There have been several email messages regarding measuring the reflectance of the heliostat mirror. This mirror is about 4 feet square. Jim Heaney stated the reflectance could be measured at GSFC in the region from about 0.4 to 3 microns.)
c) largest single piece Labsphere can make for spectralon diffuser is approx. 17 x 22 inches?
3. Comments on Stuart's mail dated 2/1/96 and mirror flatness concerns - Hongwoo Park
a) Hongwoo recommends a concept from the TOMS calibration concept which is to maximize the accuracy of the ratio of the solar measurement and the earth radiance measurement, which will include the effect of scattered light within the diffuser baffle box. This technique is essentially equivalent to measuring the BRDF of the flight diffuser with the MODIS instrument itself. The accuracy of this technique depends on the accuracy of the BRDF value of the external diffuser which can be measured to about 1 percent in the laboratory.
b) Hongwoo feels the focusing or defocusing nature of the heliostat mirror is immaterial as long as the irradiance field is uniform and the transmission can be measured with the U. of Arizona radiometer. For reflectance measurement calibration (the ratio of the earth radiance to the solar irradiance), the measurement with the radiometer is not necessary.
4. SBRC (heliostat and spectralon) - Stuart Biggar
a) Stu can order the halon diffuser as soon as we all agree it is a good approach
b) problem with no single piece of spectralon from Labsphere is 24 inches by 24 inches. The problem is gaps between the pieces and the pieces do not stay level (the edges form little cliffs).
5. RE: reflectivity measurements - Jim Young. If the only purpose of the large mirror is to test spectral reflectance, then wavelengths from 0.4 to 2.4 microns would be adequate.

Bill Barnes provides comments from Bruce Guenther, Ed Knight, Harry Montgomery, Gerry Godden and himself on what the science personnel feel is needed if STR60 is abandoned.
1) They list very specific requirements for piece-part measurements.
2) They want to know the alternative plan if the piece parts approach does not work.
3) They believe this should become an action item for SBRS and that they should respond immediately; and SBRS should prepare to review that response at the QMR.

Sal Cicchelli points out that calculated moments of inertia and products of inertia for MODIS are not being measured to a verified accurate level. The question is whether or not this is satisfactory to the Project.

George Daelemans:
1) George provides two updates on the bench test cooler via emails from Avery Galbraith. Paul Bortfeldt is involved. They are still having temperature stability problems. Paul is becoming increasingly concerned about the design of the CTS Cooling Head itself.

2) George is concerned about having sufficient IR imaging of the boards and he has prepared a memo has been prepared on this subject.

Jose Florez includes the weekly telecon with Ed Clement and Mitch Davis:
1) There are discrepancies as to what the temperature limits are for the electronics test procedures.
2) Most of the MEM boards have completed temperature testing (see concern by George Daelemans, above)
3) AEM: some units have completed temperature testing, ambient function testing, and/or conformal coating
4) Two of the five DPA hybrids were selected to be re-tested and used on the PFM. The history of these parts is in question.
5) Crosstalk testing of the PC channels will only include band 31. The other bands will NEVER be characterized.

David Jones provides technical status details in his 18 February report.

Ed Knight has provided several inputs:
1) APID plan - the MODIS plan for using our APIDs
2) BTC use - the BTC is needed after spacecraft acoustic and vibration tests. Use of the BTC at other times is still under discussion.
3) Re: MODIS Update Orbit Info - Ed is looking into any constraints with regard to simultaneous use of the blackbody and SRCA.
4) Re: TAC metadata -Ed mentions GSFC needs the log temperature files, although they do not necessarily have to be part of the metadata.
5) Measuring Spectral Response with Engineering Model Electronics - How much nosier/crosstalk susceptible are the EM electronics than the PFM electronics?
6) Re: Remarks-MODIS Sample Orbits -
a) much of our planning has presumed the OBC operations are truly independent of each other.
b) John Mehrten has listed three concerns: power allocation, thermal effects, and MODIS power supply capability.
c) John also has listed losing the cooler for a few days from going to Safe mode. This is minimize contamination when thrusters are fired. Need to look into this. Maybe a March QMR splinter session?
7) MODIS Sample Orbits - outline of GSFC's vision of 9 sample MODIS orbits to be run during S/C testing.
8) Savings on STR-60? - Equipment for STR-60 has already been manufactured.

Bob Martineau provides flight model detector status. Also, Neil Therrien will investigate using -9V rails for the NIR FPA when the unit returns for final instrument test.

John Mehrten provided four inputs:
1) RE2: MODIS Update Orbit Info - some PS characterization tests are run at the MEM level anyway. We can talk about some of the other dual OBC use.

2) MODIS Update Orbit Info - Update remarks about MODIS dual OBC use and radiative cooler repeat cool down after SVD closed/opened.
3) FW: Mass Properties: Analysis vs Test - the possibilities of deriving mass properties by analysis instead of test
4) Remarks- MODIS Sample Orbits - Initial comments on Ed's sample orbits

Gene Waluschka comments on the following:
1) Re: cleaning MODIS - Use of GSFC personnel to clean MODIS optics at Valley Forge
2) Re: Comments Re SBRS Response to Formal AIs - Addendum - Observing ice on cold focal plane windows
3) SPIE abstract - Submitting abstract on stray light simulation to the August 1996 SPIE conference in Boulder, CO. Authors are Eugene Waluschka, Shi-Yue Qiu, and Gerry Godden.

Claire Wilda provides initial comments on the sample orbits with regard to using redundant sides equal amounts of time and trying some cross-strapping.

MR
2/26/96

The detailed comments from the team members are in the appendix.

Appendix

I. Bill Barnes, Hongwoo Park, Stu Biggar, Jim Young (Comments on Solar-Radiation Based Calibration at SBRS)
Author: William Barnes <wbarnes@neptune.gsfc.nasa.gov> at Internet
Date: 2/20/96 3:18 PM
TO: syu@opt-sci.arizona.edu at Internet
Subject: **SRBC**

excerpts from Bill's message to Univ. of Arizona:

The heliostat has been ordered and Ed Byers has probably started on it by now. I had a discussion with H. Park today and we agreed that the best way to do his reflectance experiment is to aim the solar beam from the heliostat at the diffuser/SDSM opening(s) of MODIS and then redirect the beam to a halon diffuser mounted above the Earth-view port. This eliminates the need for a second mirror and the problem of elevating the heliostat between measurements to ensure the same angle off the heliostat to MODIS (discussed as a possibility in my memo of 2/14). The difference in this angle between the two parts of the reflectance measurement will alter the irradiance from the heliostat, but it is hoped that your radiometer can quantify this difference. It would be nice if we could mount your radiometer in the beam between the heliostat and MODIS at both angles each time the measurement is repeated or, we could pre(and post) measure the change with angle of reflectance and make a correction.

Park has talked to the people at Labsphere and they can supply a 24"X24" halon diffuser for $3K 3 weeks ARO. I can order this as soon as we all agree that this is a good approach.

Author: William Barnes <wbarnes@neptune.gsfc.nasa.gov> at Internet
Date: 2/23/96 9:51 AM
TO: stu@spectra.opt-sci.arizona.edu at Internet
Subject: **Comments on Stuart's mail dated 2/1/96 and the mirror flatness**

This may serve to clarify some of your concerns as to what Park is thinking. I am especially interested in your comments on Part B.

I have ordered a spare mirror for the heliostat. Ed Byers is working on it and plans to deliver in May. Gene found a device to measure spectral reflectance of the mirror. It is apparently portable. We will try to get it out to CA as soon as possible and make some measurements (the QMR at end of March?). As I told you earlier, we can get a 24X24 in. spectralon diffuser from Labsphere or maybe larger. Largest single piece they make is approx. 17X22 in.(? not sure of this). Will probably order when Park returns from CA.

Bill

Hongwoo Park
Date: Thu, 22 Feb. 1996 17:12:46 -0500
From: hwp721@rs720 (Hongwoo Park)
Subject: Comments on Stuart's mail dated 2/1/96 and the mirror flatness concerns

Here are my comments on Stuart's e-mail dated 2/1/96 and on the mirror flatness concerns. I'll be at OSC in Pomana, CA next week and I can be reached at (909)593-3581, ext 4729 (NASA desk).

A) Comments on Stuart's e-mail dated 2/1/96
i) We need to understand why we want to SRBC. Is the goal to obtain to the absolute radiance calibration for MODIS or the most accurate reflectance value from the MODIS measurement ?

If the goal is the former, SRBC used in SeaWIFs may not necessarily be the best technique. The word "absolute" is in the sense of the absolute energy scale, not in the sense used in the Slater's EUROPTO/SPIE paper. Besides the uncertainty of the Neckel and Labs' solar spectral irradiance and the uncertainties introduced in the measurements, this technique is limited by the uncertainty of the radiometer calibration and the uncertainty of the flight diffuser BRDF measurement. Undoubtedly, the SeaWIFs output counts from the in-orbit solar measurement will differ from the predicted counts with the SRBC at the ground. No approaches or plan for this possible discrepancy were offered during the September meeting at Tucson.

The SRBC technique used in SeaWIFs can be used for the reflectance measurement if the following steps are taken. The calibration constant for irradiance mode is obtained from the flux incident on the diffuser measured by the radiometer and the instrument output count. The calibration constant for radiance mode is obtained by calculating the radiance on the diffuser from the flux and the diffuser BRDF. Then the extra terrestrial solar irradiance and the earth radiance are measured with these calibration constants and from these two measurements the reflectance is determined. This technique is essentially identical to comparing the earth radiance with the onboard diffuser with known BRDF. Therefore, in this case once we know the BRDF of the diffuser, even without any ground calibration we can measure the earth reflectance in principle. However, this method will be subject to errors if there are any scattered lights in the diffuser baffle box. I believe this is one of the reasons we want to SRBC. Also typically the BRDF value is measured in the laboratory in a condition which is quite different from the MODIS measurement geometry.

The proposed concept by me from the TOMS calibration concept is to maximize the accuracy of the ratio of the solar measurement and the earth radiance measurement, which will include the effect of the scattered light within the baffle box. This technique is essentially equivalent to measuring the BRDF of the flight diffuser with the MODIS instrument itself. The accuracy of this technique depends upon the accuracy of the BRDF

value of the external diffuser. Since this is not a part of the flight instrument we have more freedom to do careful work with this plate in the laboratory. At the ideal conditions, since the error in the BRDF is the only error which can go into the reflectance measurement, this makes this technique superior to other techniques including the SRBC used in SeaWIFs. The accuracy of the BRDF measurement is achieved to about 1 % level in good laboratories, e.g. the Code 920 Facility.

ii) Here are specific comments on Stuart's concerns. My proposed concept uses the sun, not a lamp.

a) The solar beam size is approximately f/108 and the mirrors Bill Barnes is purchasing are sufficiently large. The 3 degree FOV is equivalent to ~ f/20. Therefore, there should not be problems of "walk off" , real estate for the radiometer location and size of the radiometer. Yes, we need a repeatable linear translation stage. In subsequent discussions, Bill Barnes suggested that the heliostat be used to direct the beam to the laboratory external diffuser as well as to the solar port eliminating the second mirror. In this case the BRDF of the external diffuser has to be measured at this geometry.

b) The transmission measurement by the radiometer will include not only the atmospheric but also the mirror. The reason we have to watch the mirror spectral transmission is that we have to interpolate the MODIS wavelengths from the radiometer's. If there is "interesting", not smooth, or anomalous spectral behavior, that will cause errors for the interpolation of the transmission. Even though I doubt any peculiar spectral reflectance of the mirror, a relative spectral reflectance of the mirror would be a useful reference.

c) I would leave the actual design to SBRS for the questions 4), 5), and 6). But I would place the occulting panel between the heliostat and the second mirror with an actuator mechanism if possible.

B) Comments on Mirror Flatness Concerns

Jim Young of SBRS and U. Of Arizona group raised concerns on the flatness of the heliostat mirror. I believe that the flatness concerns are not relevant to our application of SRBC. I understand that in SRBC used with SeaWIFs, the atmospheric transmission is measured by the calibrated radiometer and the solar spectral irradiance of Neckel and Labs is used to obtain the flux values at the instrument. If we measure the solar radiation after the heliostat with the radiometer like used in the SeaWIFs experiment, this measurement will provide the transmission information not only due to the atmosphere but also due to the heliostat mirror. This means that the transmission will include all the characteristics of the mirror, reflectance, surface scattering characteristic, possible focusing or defocusing due to the flatness, and polarization. The only useful measurement would be spectral reflectance measurement only if there is anomalous spectral features in the reflectance as Stuart mentioned. I have no reason to suspect that

the mirror would have a peculiar feature in the reflectance rather than smoothly varying function of the wavelength.

If I state again, the focusing or defocusing nature of the mirror is immaterial as long as the irradiance field is uniform and the transmission can be measured with the U. of Arizona radiometer.

If we are interested only in the calibration for reflectance measurement (the ratio of the earth radiance to the solar irradiance), the measurement with radiometer is not necessary.

Author: stu@opt-sci.Arizona.EDU (Stuart Biggar) at Internet
Date: 2/21/96 6:53 PM
Subject: **SRBC (heliostat and Spectralon)**

---------- Message Contents ----------

Bill,

Thanks for your message.

I expect that a solar radiometer could be placed in the beam, however, I have some concerns about the whole experiment which I have sent you in a fax (I don't know how to send a drawing in email and have not had much success looking at documents Jim emailed me (done on a MAC)). We do have to be able to aim the radiometer and get to it to change filters while taking data.

Park has talked to the people at Labsphere and they can supply a 24"X24" halon diffuser for $3K 3 weeks ARO. I can order this as soon as we all agree that this is a good approach.

We are currently trying to purchase the "largest" single piece of Spectralon that Labsphere makes. We have been told that it would be about 20" x 20" (24 x24 was "not possible"). I would check to make sure that Labsphere is quoting you a single piece. We have two of their 24" x 24" "standards": one is 9 8"x8" pieces in a mount and the other is 4 12"x12" pieces in a mount. These are not very satisfactory (and cost about $3K each). The problem is that the pieces have small gaps between them and (much worse for this experiment where the incidence angle will be about 60 degrees) the pieces do not stay level and the edges form little "cliffs" which make shadows. We are not real happy with ours (in fact we sent one back for a different mount arrangement and they just bent the outside edges of the mount). I don't think they have much engineering expertise (we have not seen it if they do). We have stopped using the Spectralon plates in the field and have gone back to BaSO4 ones that are 24" square and which we measure in our lab. They are not as stable or lambertian but they don't have shadows and gaps and they don't change as much with temperature (important in the field).

Hope this is not too negative but Labsphere has caused us some heartburn. You may fare better as you buy more things from them.

Stu

Author: "Young, James B" <jyoung@msmail2.hac.com> at Internet
Date: 2/21/96 11:50 AM
Subject: **RE: reflectivity measurements**

If the only purpose of the large mirror is to be used in the SRBC test the spectral reflectance need not be done at wavelengths greater than MODIS reflectance region. Thus wavelengths between 0.4 and 2.4 um would be adequate.

From SBRS point of view (hope I am not talking out of line) it would be advantageous for the spectral reflectance to be measured at GSFC. What is the spectral reflectance measurement uncertainty?

II. Bill Barnes (Science Recommendations if STR60 is Abandoned)
Subject: Review of our morning meeting on STR 60
Author: William Barnes <wbarnes@neptune.gsfc.nasa.gov> at Internet
Date: 2/22/96 11:00 AM

This is the output from a meeting of Guenther, Godden, Knight, Montgomery and myself this morning. Basically, this is what we feel must be done if we are to abandon STR-60. Godden has run some LOWTRAN numbers that show as many as 13 0f the IR bands will need corrections for H20 or CO2.

WLB

From: guenther@highwire
Date: Thu, 22 Feb. 1996 10:32:45 -0500
Subject: Review of our morning meeting on STR 60

The following are requirements, concerns and understandings related to using piece-part measurements for MODIS spectral characterizations.

1. Components must be stable from when the piece-part measurements were made through system completion. (Our concern here is that we have taken much of the optics apart to rework. We believe that they have used heat-guns to soften epoxy and that this might change the behavior of the components.
2. We need out-of-band spectral measurements for the individual components.
3. The piece-part measurements must have been performed in a water-free environment.
4. Why did the piece-parts components not scale to the system level for the Engineering Model?
5. What is the alternative plan if we are unable to make the piece-parts approach work satisfactorily (to meet OOB specs)?

6. We understand that Bands 31-36 must be done in the high bay because the calcium fluoride window cuts off at 10 micrometers.

We want SBRS to provide us a detailed review of this material, and believe the best time to do that is in an Audit following the QMR. We need this material more in the context of an Audit rather than a splinter - we definitely will need details to get on this subject.

I consider this should be an action item to SBRS and that they should respond to this immediately, and prepare to review that response at the QMR.

III. Sal Cicchelli (Measuring or Analyzing Moments of Inertia and Products of Inertia)
Author: Sal Cicchelli <scicchel@div720.gsfc.nasa.gov> at Internet
Date: 2/23/96 2:18 PM
Subject: MODIS Moments of Inertia Determination Options

My thoughts:

a. The PVP/PVS pp. 38-39 requires mass and center of mass to be measured; moments and products of inertia can be measured or calculated .

b. Measured instrument mass and center of mass are insufficient to determine MOI and POI to a specified accuracy.

The SBRS monthly reports do indicate that major components of MODIS are being individually weighed, but their individual centers of mass are not being measured. One could make a reasonable estimate of individual centers of mass, various instrument level miscellaneous items, like wiring etc. and instrument center of mass , perhaps from CAD system drawings, however, the term "accuracy" here is meaningless- it's more like an order of magnitude estimate with an indeterminate accuracy.

c. I believe the question here is can the EOS folks live with not knowing the MOI's and POI's to a verified accurate level, for MODIS mount interface strength and S/C controls purposes; i. e. can they live with a ballpark, unverified estimate only. On the MODIS side of the mount interface, we would need to examine the strength (not controls) issue. If inertia estimates are insufficient, then the MOI's and POI's need to be measured.

IV. George Daelemans (Bench Test Cooler Status, Two Updates)
Author: "Daelemans, George" <gdaelemans@mail724.gsfc.nasa.gov> at Internet
Date: 2/16/96 9:14 PM
Subject: **FW: BTC UPDATE (2/15/96)**
From: wgalbraith
Subject: BTC UPDATE (2/15/96)
Date: Thursday, February 15, 1996 12:43 PM

Vernon:

Here's the status (as of 11 AM this morning) on BTC development:

As you know, some while ago CTS replaced, with a more-properly-sized unit, the LN2 Inlet Valve. That required some surgery to be done to the top of the Subcooler, and turned into a very unwelcome delay. More recently, they replaced the Pressure Control Valve for the same reason. This is the metering valve in the gas vent line that is operated by the temperature controller. According to CTS, the "new" valve - although a great improvement - is still not quite right. This valve has too small a flow coefficient. In order to run with this valve (a slightly larger valve will be in place soon) a small bypass orifice was installed to provide adequate flow.

A cooled run was made late 2/13 with the modified configuration. CTS has faxed me a printout of the temperature stability achieved: over a period of 35 minutes, temperatures ranged from 78.2K to 79.4K, or 78.8K #177#0.6K. This temperature stability was with the Pressure Control Valve under the control of the T.R.I. Temperature controller (however, the LN2 inlet valve was out of the control loop and operating as a fixed orifice).

We have some cause to be concerned about the integrity of the temperature sensor on the SBRC-provided Test Dewar being used by CTS for these tests. (Tests just run by CTS indicate a ROOM-TEMPERATURE stability of about #177#0.025K for the Cooling Head diode, but about #177#0.15K for the Lake Shore sensor on the Test Dewar.) To remove any cloud on this data, installation of a new sensor was approved during your absence last week by Lee Tessmer. This sensor is at CTS now, and will be installed in the Test Dewar by Paul Bortfeldt this afternoon.

Paul and I have worked out (with concurrence from CTS) that he will first characterize all three diodes (2 in the CTS Cooling Head and 1 in the SBRC Dewar) by checking response in a bath of LN2. He will then install the new sensor in our Test Dewar. Paul will then take part in a controlled cooldown and steady-state temperature demonstration. He will give us at least a verbal report by tomorrow morning.

CTS installed (today) new software for the T.R.I. controller. This provides both better resolution and a faster sampling rate than has been used prior to today.

At SBRC/SBRS, we have vacuum gauging made up to be used for checking integrity of the innermost o-ring seal. Also, a cable has been fabricated to allow connection of Chris Laufer's instrumentation for measurement of the rate-of-change (within the stability tolerance) measurement.

I will, of course, update you with Paul Bortfeldt's report tomorrow morning.

- Avery Galbraith

Author: "Daelemans, George" <gdaelemans@mail724.gsfc.nasa.gov> at Internet
Date: 2/16/96 9:16 PM
Subject: **FW: BTC UPDATE (2/15/96, #2)**
From: wgalbraith
Subject: BTC UPDATE (2/15/96, #2)
Date: Thursday, February 15, 1996 11:21 PM

Lee:

Per your request, I forwarded Paul Bortfeldt's phone mail message to me to you. Paul stated in his message that indicated stability with the new sensor installed was not too good. I felt that I should try to get some quantification of this, so I called Paul, and was fortunate to find him in his office. (By the way, any calls Paul' makes to SBRC are all billed to his home phone.)

As far as temperature stability goes, Paul said that the stability testing was just not very successful. He said that it was getting late, and that he (Paul) pushed cooldown too fast (against the warnings of Jason Cloyd of CTS, who had been through this before). The rapid cooldown apparently set up some thermal activity that just takes too long to dampen out. A peculiarity, Paul said, was that although Test Dewar temperatures were "moving around," the Cooling Head tip diode was pretty stable.

As far as the new temperature sensor itself is concerned, Paul characterized it in a bath of LN2. It gave readings stable to #177#0.06K. The Cooling Head diode checked out essentially the same.

Paul also said that he's become increasingly concerned about the design of the CTS Cooling Head itself. He feels that the existing vent gas passage is quite possibly too restrictive. If at all possible, he would like to get the "proof of concept" LN2 coldhead we built here a couple of years ago modified to mate to the CTS transfer line, vacuum system, and vent line and sent there for him to test. His objective, as I understand him, is to determine: A) is the CTS Cooling Head design a major obstacle that control system tuning will never overcome, and, if so: B) could a design based on our old unit be made to work significantly better. We noted that any work to adapt this old unit would take a week or more, during which time CTS could be refining their system.

Rapid attainment of successful operation at CTS would still be everybody's favorite solution. I'm sure I'll have input from them tomorrow.

- Avery

V. Jose Florez (Weekly Telecon with SBRS)
Author: Jose Florez at 730
Date: 2/22/96 2:35 PM

Record of telecon w/ Ed Clement, M. Davis, and J. Florez. February 21, 1996, 2:30 pm

The test temperature limits invoked in the electronics test procedures were discussed. There are discrepancies as to what the current limits are, and these seem to be in a fluid state of change. GSFC would like to see the actual test limits used stated in the test procedures for documentation purposes. In addition, a distinction should be made between qualification and acceptance limits in the CCA procedures, even by reference to the module level procedures.

Three schedule mitigation steps being proposed by SBRS were discussed. They are: 1) Perform thermal testing on only one of each type of CCAs; 2) Perform vibration at the module level on all three axis with no verification testing in between. Test at the end of shake in three axis; and, 3) Modify the temperature cycling tests to perform performance testing only during the first two and the last two plateaus (high and low), with four consecutive cycles with power on and no testing in between. In addition reduce the time spent at each plateau from the present 4 hours. We feel that these are changes that, although not ideal, we can live with.

MEM 184-pin connector replacement continues at SBRS. In addition most of the boards have completed temperature testing.

AEM Status:

SAM CLK_BIAS/TLM both units were temperature tested and Conformal Coated SAM
ACE/ACE one unit has completed ambient function testing
SAM CLK_BIAS/ACE one unit has completed ambient function testing SAM Box is still under assembly

FAM TIMING/CONTROL both units were temperature tested and Conformal Coated
FAM PC AMP one unit has completed ambient function testing
FAM Box is assembled (Motherboard inner side has been Conformal Coated, outer side will be completed after cables are tested.)

CLAM Cable is still under assembly, no testing started

Hybrid Issue:

2 of the 5 DPA hybrids were selected to be re-tested and used on the PFM. Sypex will complete additional testing on those two units. The history of these parts is in question. The testing includes acceleration, leak test and 20 thermal cycles.

To prevent a repeat of the problem, the next copy of the hybrids will have a 40 mil base (twice as thick). Additionally, the cleaning procedure has been changed and the leak test has been changed to a lower pressure for a longer time.

The CLAM test procedure will be totally changed to test the CLAM with the FAM. (I finished review of this procedure 40 minutes ago.)

The Crosstalk testing of the PC channels will only include band 31. The other channels will NEVER be characterized.

VI. David Jones (Excerpts from Weekly)
Subject: WEEKLY REPORT FROM DAVID JONES -- W/E 18 February 1996

1.0 PFM AOP Status: A decision was made to re-work all glass-to-metal bonds, and re-bond using RTV (CV2500) in place of epoxy (2216). After a thorough review of the failures and consultation with a Hughes EOS adhesive expert, it was considered that CV2500 was easier to control in its application, more forgiving to thermal cycling, and less likely to cause localized stresses on the lens elements. Out-gassing of CV2500 is negligible. Contamination from silicone (by tactile transfer and "creep"), is a concern, but considered a low risk with suitable care in the application process.

1.1 Damage Report : The PFM AOP Optical elements which failed environmental test are listed here for the record, and a table produced by SBRS, identifying all the optical elements, their materials, mass properties, and effective bonding surface areas, is being emailed separately to this report. The bond-line thickness (radial clearance) is 0.015 to 0.018 for all lens holders.

(Editor's note: The SBRS table which identifies all AOP optical elements is at GSFC and is available upon request.)

a) PFM S/MWIR: The E2 (Cadmium Telluride), E3 and E5 (Zinc Selenide) lenses was damaged
b) PFM LWIR: The E2-Threaded-Ring became unbonded, The E4/E5 Aperture Stop came loose, also the LW Warm Shield became partially debonded.
c) PFM VIS and NIR survived vibe (possibly one could say that these elements do not need re-working! however, the EM VIS and NIR experienced vibe failures, so SBRS are taking no chances this time)

1.2 Recovery Plan Summary:

a NIR OLA: A new NIR OLA has already been assembled using FM1 parts and CV2500 as the adhesive.
b) VIS OLA: A dual path is being taken, the PFM OLA will be dis-assembled and re-worked as a parallel effort to fabricating a new one from FM2 parts (which ever finishes first, will be used)
c) S/MWIR OLA: Will be rebuilt using the PFM housing and new E2, E3, and E5
d) LWIR OLA: Will be rebuilt using the PFM housing and a new Stop and a new Warm shield.

1.3 Environmental Test

a) Thermal: All items listed in 1.2 (a -d) will be thermally tested to the PVP/PVS (151800).

b) Penalty Vibe: The S/MWIR and LWIR OLA items will be vibrated on a test fixture, to the levels previously approved by GSFC for a "Penalty" vibe.. The VIS and NIR OLA's, and the S/MW and LW Eye Lenses will not receive separate penalty vibes. Factors driving this decision are: a) unavailability of suitable test fixtures, b) uncertainty of what would constitute an appropriate penalty vibe, c) the fact that the PFM VIS and NIR experienced no failures , d) all parts will receive a further vibe at the assembled AOP level.

Note: SBRS do not intend subjected the AOP to another Grms profile of the same level as on 2-3 Jan 1996. A reduced level (which I will refer to as the "SBRS Acceptance Level" is being proposed). This profile is defined in Tom Wolverton's memo PL. 3095-R 00640, dated 2/7/92 (SBRS will confirm this when they discuss their Penalty Vibe plans with GSFC mid-next week). Factors driving this decision are: a) SBRS do not want to risk fatiguing the graphite -epoxy platform, b) all of the failed items (except the Eye lenses) will have been penalty vibrated separately, c) the FPA co-registration problem does not appear to have been a function of the AOP. In conclusion, this approach is considered by SBRS to carry only a small risk.

2.0 Adhesive -Proof of Process: Although there is a wealth of experience within the Hughes Company, in the use of CV2500 as an adhesive for Space-optics, it is new to the MODIS Project. Accordingly, SBRS plan to prove the process by fabricating some lens assemblies (using reject EM parts) for thermal, vibe and static load tests. Details of the tests planned will be provided as soon as details are available. (It would be nice if GSFC could run some tests to back up this effort, since time is of an essence, and we cannot afford any more errors).

3.0 PFM Rad Cooler Status: The cable-harness-shield-short reported last week has been resolved. As small silver-copper ball was found resting at a shield-to-ground intersect causing a 12 ohm-short. The foreign body is speculated to be a "splutter" created during the brazing of the dewar stem.

The Rad Cooler (RC) is now re-assembled and no further tests (thermal or vibe) are considered necessary for it to be, in due course, re-integrated with the AOP.

Note: The portion of the RC to AOP that is "glued" together, is the base of the cold shield, Normally this is done after all OBA alignment tests are complete. The AOP and RC are not intended to be separated after this procedure, but it obviously can be ... done with care (it was successfully accomplished in the case of the PFM RC).

VII. Ed Knight (Several Topics)
Author: eknight@highwire.gsfc.nasa.gov (Ed Knight) at Internet
Date: 2/20/96 9:11 AM
Subject: **APID plan**

After discussions with several MCST personnel and the Level 1A developer, I am submitting the following as the MODIS plan for using our APIDs.

1. For normal operations, all MODIS science data stream packets from the same instrument will have the same APID.

2. When it is necessary to use the Expedited Data Service, this will be done by toggling the QuickLook Flag in the secondary header. The APID number will not change.

3. The ability to change the APIDs by ground command will be retained in the flight software. The current APID limits will be retained (no more than 3 APIDs, one each for the Science, Engineering, and (former) Memory Dump packets respectively).

4. The command to change the APIDs by ground shall be designated a critical command and subject to at least the following constraints:

A. The Change APID command can only be sent during real-time contact.
B. The Change APID command cannot be sent unless the ground segment has been given 48 hour (TBR) notice of the pending change.
C. Appropriate warning messages to the FOT before transmission.

5. Other constraints are being considered and will be entered into the database when a consensus has been reached. These include:

A. Omitting the Change APID command from the database entirely until it is required for use.
B. Constraining the Change APID command to not be bundled with other commands.
C. Any other suggestions that arise to prevent this command from being sent by accident or out of ignorance.

Author: eknight@highwire.gsfc.nasa.gov (Ed Knight) at Internet
Date: 2/20/96 1:26 PM
Subject: **BTC use**

Just a note to follow up on the minutes--

In Bill Mocarsky's email of January 22, the SBRS position was to not use the BTC at Valley Forge except during BAT. During the accommodations teleconference on January 23, we agreed with SBRS that we would need to check the cold focal planes after

spacecraft acoustic and vibration tests and would therefore need the BTC then. Use during other times is still under discussion.

Author: eknight@highwire.gsfc.nasa.gov (Ed Knight) at Internet
Date: 2/20/96 11:14 PM
To: John Mehrten
Subject: **Re: MODIS Update Orbit Info**

I've raised the dual calibrator problem here. George indicated he would look into the thermal issues. Before Ron gets too spun up, it might be valuable to check with him.

Also, I think we should discuss the requirements for characterizing the effect of having the BB and SRCA on simultaneously before you run any STR. My ultimate requirement is to know what the operational constraints are, and how hard or soft they are. These might be best characterized by constraining which SRCA modes can operate with the BB on, or which commands should be constrained, or what telemetry values are critical to monitor, and the violation of the constraint could result in a wide range of options from 'nothing happens' to a component failure. It seems to me that we run a different test depending on the constraint we're interested in characterizing. I think if we have this discussion first, we'll be better able to determine what type of STR needs to be run, and if it needs to be at MEM, instrument, or S/C level.

Author: eknight@highwire.gsfc.nasa.gov (Ed Knight) at Internet
Date: 2/20/96 1:42 PM
Subject: **Re: TAC Metadata**

First, we do write our own reduction files, so we do want the temperature log files delivered to GSFC.

However, that does not necessarily require them to be part of the metadata or delivered simultaneously with the instrument data. It does require that we be able to determine which temperature log files were taken with which set of science data, so the time tags, etc. need to be accurate.

The calibration source temperatures do change from test to test. If we are only going to get that information in the template files, then we need a new template file to accompany every new test. In other words, we will need a template file for the BCS calibration (RC-01 I believe) at instrument nominal, and then a new template file when the BCS calibration is run at instrument cold, and then a new template file when the BCS calibration is run at instrument hot, and the analogs for all tests using the IAC or SIS(100). This is very close to saying that we will need a new template file for every UAID.

If SBRS is willing to sign up to making these deliveries, we probably don't need to amend the actual metadata files, but that's a question of efficiency. We at GSFC need to get this data one way or another.

Otherwise, it is not possible to confirm the validity of latter tests where the template has not been updated. Nor is it possible to confirm the instrument short-term stability, if we cannot identify which changes in the data are due to small changes in the instrument performance and which are due to differences in the sources.

Subject: **Measuring Spectral Response with Engineering Model Electronics**
Author: eknight@highwire.gsfc.nasa.gov (Ed Knight) at Internet
Date: 2/15/96 12:44 PM

During the meeting Tuesday, I was asked to send an email identifying our concern with measuring spectral response with the Engineering Model Electronics rather than the PFM electronics.

In general this is not a problem. Our concern is with respect to the measurable signal. At the edges of the extended bandpass and in the out-of-band regions, we are measuring very small signals. These may be obscured by crosstalk and other noise problems in the electronics. Since the EM electronics have more crosstalk/noise than the PFM electronics, it is possible for us to fail to measure a signal with the EM electronics that would be visible with the PFM electronics.

Thus, the only question is, how much noisier/crosstalk susceptible are the EM electronics than the PFM electronics? If the answer is that the differences are small, then there should be no problem using EM electronics to measure the system Relative Spectral Response.

Author: eknight@highwire.gsfc.nasa.gov (Ed Knight) at Internet
Date: 2/19/96 9:27 AM
Subject: **Re: Remarks-MODIS Sample Orbits**

John,

Your comment about only being able to operate one OBC at a time is significant. Much of our planning has presumed that they are truly independent of each other--that I can operate the SD/SDSM, SRCA, and OBC BB heater all simultaneously. We are particularly interested in being able to run the SD/SDSM and SRCA simultaneously.

In your email, you cite three possible concerns--1. power allocation, 2. thermal effects, and 3. MODIS power supply capability. I have presumed that the first can be addressed by summing the increase in power (deltas) for each of the OBCs. From the monthly

power reports I remember (and will have to check) that we had plenty of margin to allow this (something like 3-4 times what the OBC BB heater drew).

However, I do not know the best approach to investigating your other two concerns. I will cc: this to George Daelemans and Mitch Davis for their opinions. The question I have for you is, do you think these are likely to be real problems, or is this a case of just making sure we don't get surprised? If the latter, it may be worthwhile to run the orbits as proposed to find out if we do see an effect.

You also mention a significant impact to going to Safe Mode in that we will lose the cooler for a few days. Currently, the baseline plan is to go to Safe mode when the thrusters are fired during drag make-up maneuvers to minimize contamination. This no longer sounds like a good option. Has anyone there thought about this?

I ask because I'm supposed to present the MODIS Operations plan during drag make-up maneuvers at the April Ops Workshop. Perhaps this is an appropriate splinter discussion during the March QMR.

Author: eknight@highwire.gsfc.nasa.gov (Ed Knight) at Internet
Date: 2/16/96 10:09 AM
Subject: **MODIS Sample Orbits**

During Spacecraft Integration Tests, Lockheed-Martin plans to run several (eight plus) sample orbits. These will be part of both the interference test and the Comprehensive Performance Tests. These sample orbits are to be designed jointly between us and SBRS. In an Accommodations teleconference on January 23, we agreed to provide our vision of sample orbits to SBRS by February 15. This email answers that action item.

Sample Orbits

All orbits begin at the equatorial crossing on the dark side of the orbit. All times are in minutes:seconds and should be taken as first approximations. They should also be modified to establish consistency with Instrument level tests at SBRS. Items in brackets are orbital events that would be set by the Lockheed-Martin Team.

Since the circulation of the draft of this memo, I have been directed to assume 50/50 day/night mode data rates, as per a request from Vince Salomonson to Project.

These are designed to represent the types of orbits to be run during S/C testing. The number of each that are run will require further discussion with the S/C test team.

1. Simple Orbit

This is designed to be the basic MODIS operational orbit, representing the normal operating situation.

Steps: A. 00:00 Begin Orbit in Night Science Mode
B. 16:00 [terminator crossing]
C. 25:00 Transition to Day Science Mode
D. 75:00 Transition to Night Science Mode
E. 83:00 [terminator crossing]
F. 99:00 End Orbit

2. Simple Solar Calibration Orbit

This is designed to be a 'typical' calibration orbit for the solar reflective bands. I've calculated the SD times based on PL3095-N03286 (#1590--November 1993). These should be replaced with more precise geometries before implementation.

Steps: A. 00:00 Begin Orbit in Night Science Mode
B. 05:00 Begin SRCA 1W Radiometric Calibration Mode
C. 10:00 Begin Solar Calibration [terminator -6 min]
Operate SDSM
Open SD door if functional and clean environment
D. 13:30 End Solar Calibration [terminator -2.5 min]
E. 16:00 [terminator crossing]
F. 25:00 Transition to Day Science Mode
G. 75:00 Transition to Night Science Mode
H. 83:00 [terminator crossing]
I. 95:00 End SRCA 1W Radiometric Calibration Mode
J. 99:00 End Orbit

3. Simple Thermal Calibration Orbit

This is designed to check the OBC BB heater and calibration in the heated mode. I've also included the Ecal Tests in here, since linearity is more of an issue for the thermal bands. Note that this ends with the OBC hot! Normal heating/cooling is supposed to take several orbits.

Steps: A. 00:00 Begin Orbit in Night Science Mode
B. 02:00 Begin heating OBC BB.
C. 16:00 [terminator crossing]
D. 25:00 Transition to Day Science Mode
E. 40:00 Begin PV Band Ecal
F. 42:00 End PV Band Ecal
G. 50:00 Begin PC Band Ecal

H. 52:00 End PC Band Ecal
I. 75:00 Transition to Night Science Mode
J. 83:00 [terminator crossing]
K. 98:30 Turn off OBC BB heater (if no heater on next orbit)
L. 99:00 End Orbit

4. Spectral Characterization Orbit

Nainzeng Che and others have spent substantial time looking at how the radiometric and spectral SRCA modes can be used to check each other. This orbit runs such a sequence, and gets us spectral data for trending. Note that this uses the 10W bulbs extensively and so should be run infrequently.

Steps: A. 00:00 Begin Orbit in Night Science Mode
B. 01:00 Begin SRCA Full Spectral Mode
C. 16:00 [terminator crossing]
D. 25:00 Transition to Day Science Mode
E. 71:00 End SRCA Full Spectral Mode
F. 72:00 Begin SRCA Full Radiometric Mode
G. 75:00 Transition to Night Science Mode
H. 83:00 [terminator crossing]
I. 90:00 End SRCA Full Radiometric Mode
J. 99:00 End Orbit

5. Spatial Characterization Orbit

This orbit uses the SRCA Spatial Calibration Mode to gather corregistration data for trending.

Steps: A. 00:00 Begin Orbit in Night Science Mode
B. 16:00 [terminator crossing]
C. 25:00 Transition to Day Science Mode
D. 32:00 Begin SRCA Full Spatial Mode
E. 69:00 End SRCA Full Spatial Mode
F. 75:00 Transition to Night Science Mode
G. 83:00 [terminator crossing]
H. 99:00 End Orbit

6. High Noise Orbit

This orbit runs everything--it's designed to create the maximum disturbances possible for the other instruments. There should be two variations for the SRCA spectral mode--one where we do the full mode, and one where we only use 1W bulbs (preserve lifetime and use during subsequent runs

when we're troubleshooting).

Note that Day Science Mode starts and ends at different times than normal.

Steps: A. 00:00 Begin Orbit in Night Science Mode
B. 01:00 Begin SRCA Full Spectral Mode
C. 02:00 Begin heating OBC BB
D. 05:00 Transition to Day Science Mode
E. 10:00 Begin Solar Calibration [terminator -6 min]
Operate SDSM
F. 13:30 End Solar Calibration [terminator -2.5 min]
G. 16:00 [terminator crossing]
H. 20:00 Begin PV Band Ecal
I. 22:00 End PV Band Ecal
J. 30:00 Begin PC Band Ecal
K. 32:00 End PC Band Ecal
L. 55:00 Transition to Night Science Mode
M. 71:00 End SRCA Full Spectral Mode.
N. 83:00 [terminator crossing]
O. 98:30 Turn off OBC BB heater (if no heater on next orbit)
P. 99:00 End Orbit

7. High Sensitivity Orbit

This orbit is supposed to put MODIS in the quietest mode possible in order to detect interferences from other instruments that the sneak past the glitch monitor. It requires we perform analysis multiple ways--we need to look at the SRCA data from a radiometric standpoint and from a spatial registration standpoint.

Steps: A. 00:00 Begin Orbit in Night Science Mode
B. 01:00 Begin SRCA 1W Scan Direction Spatial Mode
(this is similar to 1W radiometric mode except
thermal source is also on).
C. 10:00 Begin Solar Calibration [terminator -6 min]
Operate SDSM
Open SD door if functional and clean environment
D. 13:30 End Solar Calibration [terminator -2.5 min]
E. 16:00 [terminator crossing]
F. 25:00 Transition to Day Science Mode
G. 75:00 Transition to Night Science Mode
H. 83:00 [terminator crossing]
I. 95:00 End SRCA 1W Radiometric Calibration Mode
J. 99:00 End Orbit

8. Real Time Contact Orbit

This orbit is included more for the mission simulations near the end of Spacecraft testing. We will want an orbit where we check out the ground-instrument real time commanding. I've proposed a memory load and memory dump as a good test of the protocol and contact success (analysis is easy--did the table load successfully and then did it dump successfully? A quick bit comparison answers the question).

I recommend we load and dump the sector start time table. SRCA/BB data during the scans where the alternate table is in place will confirm the success of the load.

Steps: A. 00:00 Begin Orbit in Night Science Mode
B. 01:00 Begin SRCA 1W Radiometric Mode
C. 16:00 [terminator crossing]
D. xx:00 [First real-time contact]
Load Memory Table
E. 25:00 Transition to Day Science Mode
F. 75:00 Transition to Night Science Mode
G. xx:00 [Second real-time contact]
Dump Memory Table
Load original Memory Table
H. 83:00 [terminator crossing]
I. 98:00 End SRCA 1W Radiometric Mode
J. 99:00 End Orbit

9. Mode Change Orbit

This orbit is included for the mission simulations near the end of Spacecraft testing. We want a test of our 'go to safe mode' command and recovery ability. Note that this could be run as an 'interrupt' on any of the above orbits. Also note that these is no transition from night science mode to day science mode due to the expectation that we're Safed at that time.

Steps: A. 00:00 Begin Orbit in Night Science Mode
B. 16:00 [terminator crossing]
C. xx:00 [First real-time contact]
D. xx:00 [Command from S/C or ground to Safe]
E. xx:00 [Second Real-time contact]
initiate recovery procedures

F. 83:00 [terminator crossing]
G. 99:00 End Orbit

Author: eknight@highwire.gsfc.nasa.gov (Ed Knight) at Internet
Date: 2/20/96 4:33 PM
Priority: Normal
Subject: **Savings on STR-60?**

The January Monthly report from SBRS, p. 41 states that equipment for STR-60 has already been manufactured and the SpMA was already set up. How much are we really saving by abandoning this test now?

VIII. Bob Martineau (Flight Model Detector Status)
February 20, 1996
SUBJECT: Weekly Input for 2/20/96

1) Flight Model 1 Detective Assemblies and FPAs:

- The NIR, VIS, and SMWIR F1 FPAs have been delivered. The F1 LWIR CTI was held Feb. 16. The unit was accepted with the exception of a functional retest of the PC bands to determine whether a stair step appearance of the wave form was due to a test set anomaly as suspected, or to something else. One band will be retested to check this out.

2) Flight Model 2 Detective FPAs:

- The F2 VIS and NIR FPAs have been delivered. The F2 LWIR DA completed radiometric testing and is awaiting a filter/bezel assembly. All pixels were operational. The filters are being mounted to the mask and the dimensions will then be measured for machining of the bezel. SBRS is looking into possibly using the bezel from the F1 filter/bezel assembly which was returned due to DMC peeling on the mask.

- The F2 SMWIR DA completed radiometric tests and is also awaiting a filter/bezel assembly. A filter/bezel build is in process. A bezel completed machining at Speedring. FPA delivery to Systems Division will be 2 weeks after receipt of the filter/bezel assembly.

3) Saturation of NIR FPAs:

- Mary Ballard spoke to Neil Therrien about increasing the rails to alleviate premature saturation of the NIR FPA. Neil will investigate using -9V rails for the NIR FPA when the unit returns for final instrument test.

IX. John Mehrten (Update Orbit Information; Mass Properties, Sample Orbits)
Author: "Mehrten, John A" <jmehrten@msmail3.hac.com> at Internet
Date: 2/21/96 3:07 AM

Subject: **RE2: MODIS Update Orbit Info**
---------- Message Contents ----------
Ed,

o Touch - - I'll get in touch with Ron Choo tomorrow and get him to talk to George. I haven't yet talked to Ron during these msg exchanges (just email CC).

o Test - - I should have provided more elaboration about tests at the MEM level. Because of accessibility aspects, we need to run some PS characterization tests at the MEM level anyway. Part of the results of this test would probably provide us with what we need to know about the +30V power form. Higher level tests might follow after the next item discussions.

o Dual OBC - - We can talk about some of the other dual OBC use aspects that you mentioned below in your msg.

From jmehrten@msmail3.hac.com Tue Feb. 20 19:13:21 1996
From: "Mehrten, John A" <jmehrten@msmail3.hac.com>
Subject: **MODIS Update Orbit Info**

This msg has some update remarks about MODIS dual OBC use and radiative cooler repeat cool down after SVD closed/opened.

1. Dual SDSM & SRCA Use - - I carefully looked at the power of using the SD/SDSM together with the SRCA in 1W radiometric mode as proposed by your Sample Orbit 2, and conclude that there should be no problem in doing this.

2. Dual BB Htd & SRCA Use - - With these two OBCs, there are still the concerns of 1) thermal effects & 2) MODIS +30V form PS capability, that will take longer to more fully assess.

The thermal concern might be ok because of the time constants if both items were not run for a full orbit, or, if the SRCA was not run at max 30W lamp capacity. I need to send Ron Choo a set of power per location conditions to assess this from the thermal viewpoint.

The +30V form is used for the heated BB, all door motors, and all OBC motors, plus a small amount in the MEM & SAM. Rather than depend upon paper analysis of several complex combinations, I want to wait to definitively answer this after Dave Rogers and I can run an STR during MEM integration with some simulated loads, or, System Integration with real loads. The system level is the preferred level of test, but STRs may be hard to schedule considering our delayed schedule status. It probably is doable, but I want to wait for some data acquisition. If it looks marginal, we might try your telecon suggestion for S/C integration, to turn the OBCs on and monitor a few critical

temperature points.

3. Radiative Cooler Repeat Cool Down - - My first msg remarks indicated a 2-3 day time period if the SVD was closed, due to Safe Mode or Orbit corrections. Considerations of the EM TV setup, might mitigate this impact a little. From EM TV data it took about 3 days to cool from an OG state to LTA the 1st time, but about 2 days to reach 85K. The 2nd LTA doesn't provide meaningful info because it was initiated with the CFPAs already at 88K. If the radiative cooler has been conditioned to orbit space conditions, rather than to a hotter OG condition, it may have a cooler initial point to start cooling from. Also, cold space should be a more effective cooling source than a test SBS at 24K.

Author: "Mehrten, John A" <jmehrten@msmail3.hac.com> at Internet
Date: 2/20/96 7:20 PM
Subject: **FW: Mass Properties: Analysis vs Test**

---------- Message Contents ----------

Mike, Tom Pagano asked me to forward this, so you'll be aware of some cost/schedule items our MODIS team is entertaining...JAM

From: Mehrten, John A on Tue, Feb 13, 1996 4:43 PM
Subject: Mass Properties: Analysis vs Test

o Mass Properties Tests - - During the Systems Engineering mtg this AM, Duane Bates reported on a coordination test planning trip to Space & Comm. Tests for Mass properties, Moments of Inertia and Products of Inertia were mentioned as topics of discussion.

o Analysis vs Tests - - I remember in one of the I/F telecons one time you mentioned something to the effect that the accuracy tolerance for Moments of Inertia and Products of Inertia are so large, that earlier calculated values from CDR were still probably valid.

o Cost/Schedule Savings - - Are there potential program costs & schedule savings by deriving these values by analysis, rather than actual tests? Would this carry over into fixtures also?

o GIIS Rqmts - - I pulled the GIIS Mechanical Rqmts. They are:

3.4.2 Instrument Mass Measurement...s/b measured to #177#0.05kg.

3.4.6 Center of Mass Documentation ...s/b measured & reported to #177#5mm.

3.4.7.2 Moments of Inertia Accuracy...to within #177#10%.

3.4.8.2 Products of Inertia Accuracy...to within #177#10%.

Hardcopy of GIIS rqmts are enclosed for AD, JB, WC & JN.

Author: "Mehrten, John A" <jmehrten@msmail3.hac.com> at Internet
Date: 2/19/96 3:10 AM
Subject: **Remarks-MODIS Sample Orbits**

---------- Message Contents ----------

(Note Item 3, which really addresses a different topic.)

Ed, This msg provides some initial comments to your sample orbits. These are my remarks from a configuration power viewpoint. Pagano, Young or Therrien may remark later on performance goals (this aspect looks Ok to me).

1. Orbit Definitions - - The general configuration & activity definitions look good (except for next item). They provide a clear picture of intent and cover a broad expanse of activities.

2. Orbits #2 & #6 Power - - Both of these orbits have more than one OBC on at a time (#2: SD & SRCA; #6: SD, SRCA & BB). These may have to be redefined as sequential, rather than parallel operations due to the following.

We have always defined our Science & OBC modes as one OBC in operation. It may be possible to simultaneously operate with more than one. There are 3 basic concerns 1) S/C power allocations, 2) thermal effects and 3) MODIS power supply capability. All the OBCs and doors use the +30V form (and other forms).

I'll have to look deeper into this multiple ops issue. From a power allocation & PS capability viewpoint, it may be feasible to run the SD & SRCA as proposed. I can see how this would be desirable from a Solar Calibration aspect. Anyway, I'll look into it.

3. SVD Closed Impact - - Your Orbit 9 remarks about Mode Chgs and recovery rung a bell. Ron Choo/Thermal analyst reminded me the other day, that whenever we close our Space View Door (SVD), the Radiative Cooler will warm up rather quickly, and will require 2 to 3 days to cool down again.

This will not be a problem in S/C TV because the SVD will not be installed due to interference with the Test Space Background Simulator used for the Radiative Cooler. However, on-orbit, after going Safe or to Survival, this will limit operations to VIS & NIR bands for a couple of days afterward.

X. Eugene Waluschka (Cleaning Optics at Valley Forge,
Author: Eugene Waluschka at 710
Date: 2/23/96 3:12 PM

Subject: Re: cleaning MODIS

---------- Message Contents ----------

Folks:

Yes we can clean MODIS at Valley Forge.

Gene

_____ Forward Header _____
Subject: Re: cleaning MODIS
Author: John Osantowski at 710
Date: 2/23/96 3:05 PM

We should set up a meeting with Mike and 717 personnel to address who, what, and how. Someone should provide drawings photos etc. Pick some target times and work to schedule it. 717 attendees should include: Miner, Fleetwood, Heaney, Keski-Kuha, & Treekrem. These are my fist guess.

John O

Author: Eugene Waluschka at 710
Date: 2/16/96 12:04 PM
Subject: Re: **Comments Re SBRS Response to Formal AIs - Addendum**

Regarding the question of ice building up on the windows in front of the cold focal planes and how to determine if there is ice on them, how about the following suggestion - just look at them. What I have in mind is comes from the following observation. If you stand in the right position and the scan mirror is, of course positioned correctly, you can see the VIS and NIR focal planes. Each band is of a different color because of the reflective properties of the focal plane filters and each filter appears to be about one foot high. Actually they appear a bit smaller, but still large and clearly visible. So, why not look at the two focal planes with a IR camera? SBRC and SBRS have camera's which cover the wavelength range. You can even try them out before entering the vacuum chamber to see how things work or look. Certainly standing in front of MODIS and observing the VIS and NIR focal planes was relatively easy. How much more difficult is it to set up a IR camera in the clean room and take a look into MODIS? I suggested this awhile ago and there may even be a SBRC memo floating about discussing this approach.

Author: Eugene Waluschka at 710
Date: 2/20/96 1:12 PM
Subject: SPIE abstract
---------- Message Contents ----------
Folks:

I have submitted the following abstract to the August 1996 SPIE conference in Boulder. Comments, please.

Gene
1. Conference Chair: Robert P. Breault

Stray Light and System Optimization: Theory, Surface Spectral Characteristics, and Techniques

2. Authors

Eugene Waluschka
NASA/GSFC/717.4
Greenbelt, MD 20771

Shi-Yue Qiu
General Science Corporation
7501 Forbes Blvd., Suite 103
Seabrook, MD 20706

Gerry Godden
Physics Applications Inc.
1502 Laurel Hill Road
Vienna, VA 22182

3. Title: MODIS Stray Light Simulation

4. Abstract

The Moderate Resolution Imaging Spectroradiometer (MODIS) will be one of the primary instruments observing the earth on the Earth Observing System (EOS) scheduled for launch at the end of this decade. It's 36 spectral bands ranging from 0.4 to 14.4 microns will image the entire earth. The radiometric requirements are such that the contributions to the optical point spread function from optical ghosts, scattered light and cross-talk in the very small spectral filters, located near the focal planes, must be characterized very well and kept to a minimum. This paper will describe a series of Monte Carlo simulations of the propagation of light through the optics in order to determine the extent of the ghosting and scattered light. These results are also compared with experimental data.

5. Keywords: radiometry, straylight, ghosting, scattered light

XI. Claire Wilda (Comments on Sample Orbits)
Author: cwilda@eos.vf.mmc.com at Internet
Date: 2/21/96 2:18 PM
Subject: Re: MODIS Sample Orbits
---------- Message Contents ----------

My initial comment about orbits has to do with the fact that, during S/C-level I&T, we try to operate redundant sides for equal amounts of time. We also try some cross-strapping. I don't know how deep inside MODIS we get before A & B sides don't count. But I do think we might perform a simple solar calibration orbit using one lamp one time and another lamp another time. To us, this would be in different orbits. (i.e., We would have at least two simple solar calibration orbits.) Another example of something with "side" is power, so I would expect a simple orbit using one power supply and a second simple orbit using the other power supply. I think we (SBRS, GSFC, RDC, LMMS) need to review the list of sample orbits and see what the implications are.

More later.
Claire